



浙江大学

Zhejiang University

Turning pints of global anthropogenic nitrogen creation and their climate effect

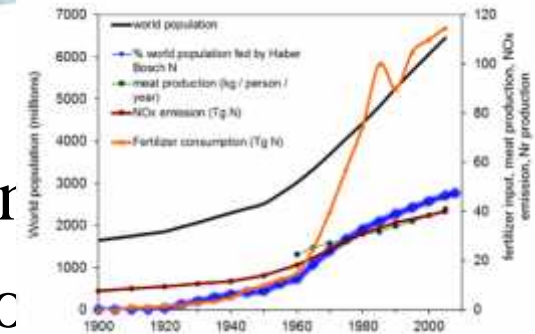
Baojing Gu^{*}, Xiaotang Ju, Yiyun Wu, Jan Willem Erisman, Albert Bleeker, Stefan Reis, Mark Sutton, Shu Kee Lam, Pete Smith, Oene Oenema, Rognvald Smith, Deli Chen, Xuehe Lu, Xinyue Ye

Melbourne 2016

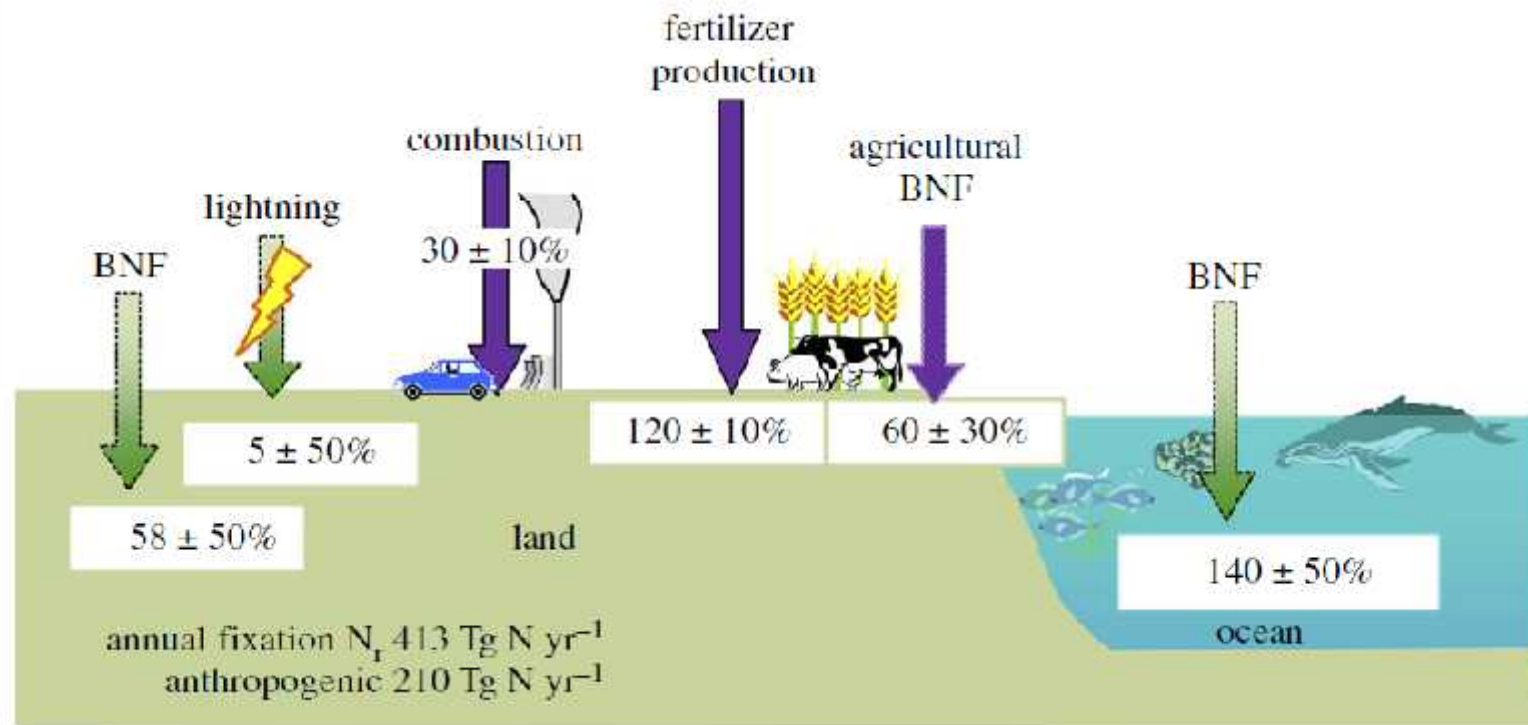


Managing Reactive Nitrogen

- **Positive aspects:**
 - Food production, both vegetal and animal
 - Goods production, nylon, explosive, etc.
- **Negative aspects:**
 - Main pollutant to air ($PM_{2.5}$, O_3),
 - water, soil, climatic change
 - biodiversity loss

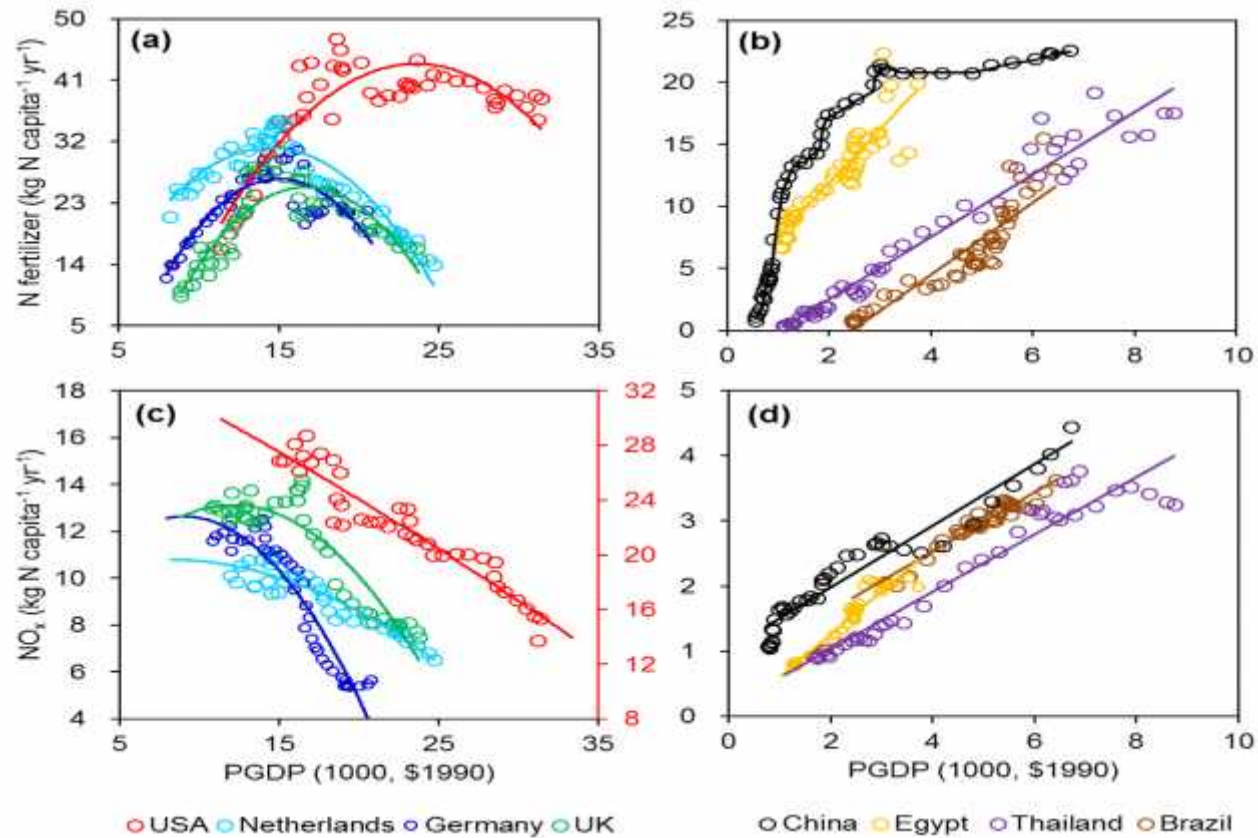


Nr inputs

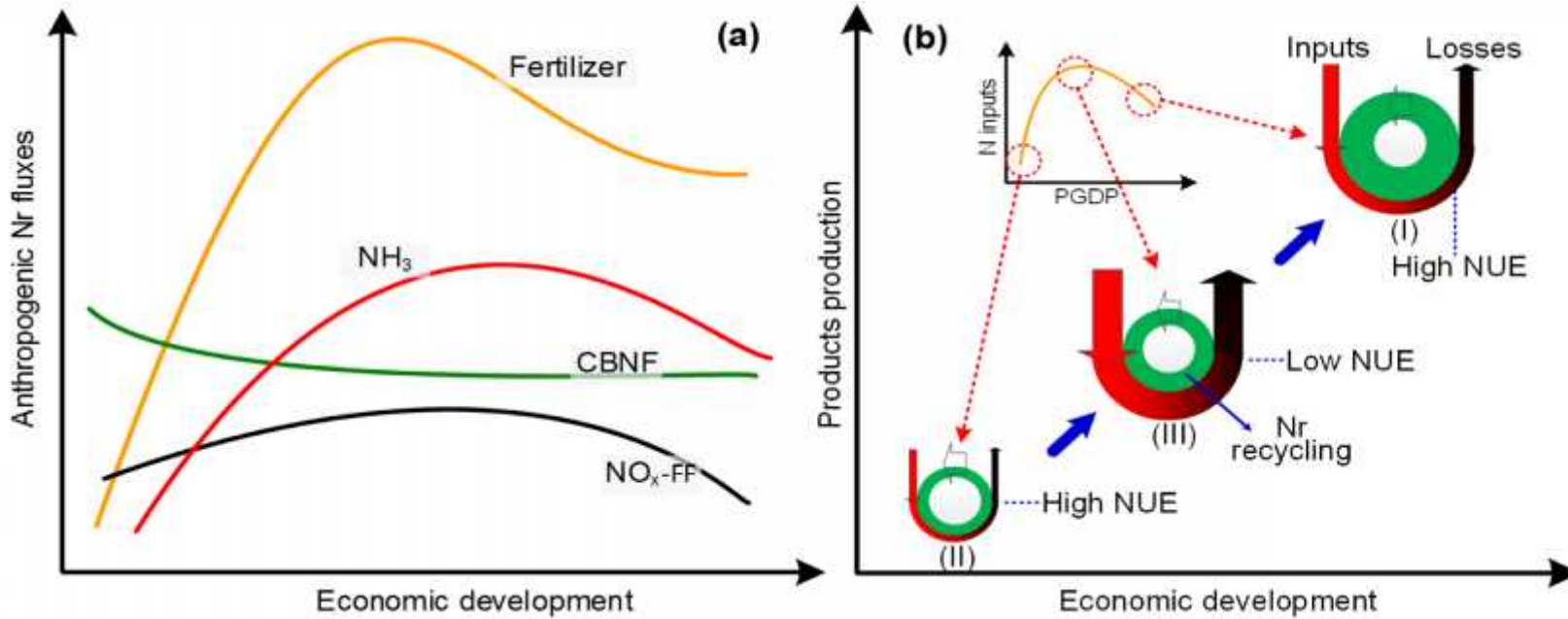


Fowler et al., 2013

Typical cases



Hypothesis (EKC)



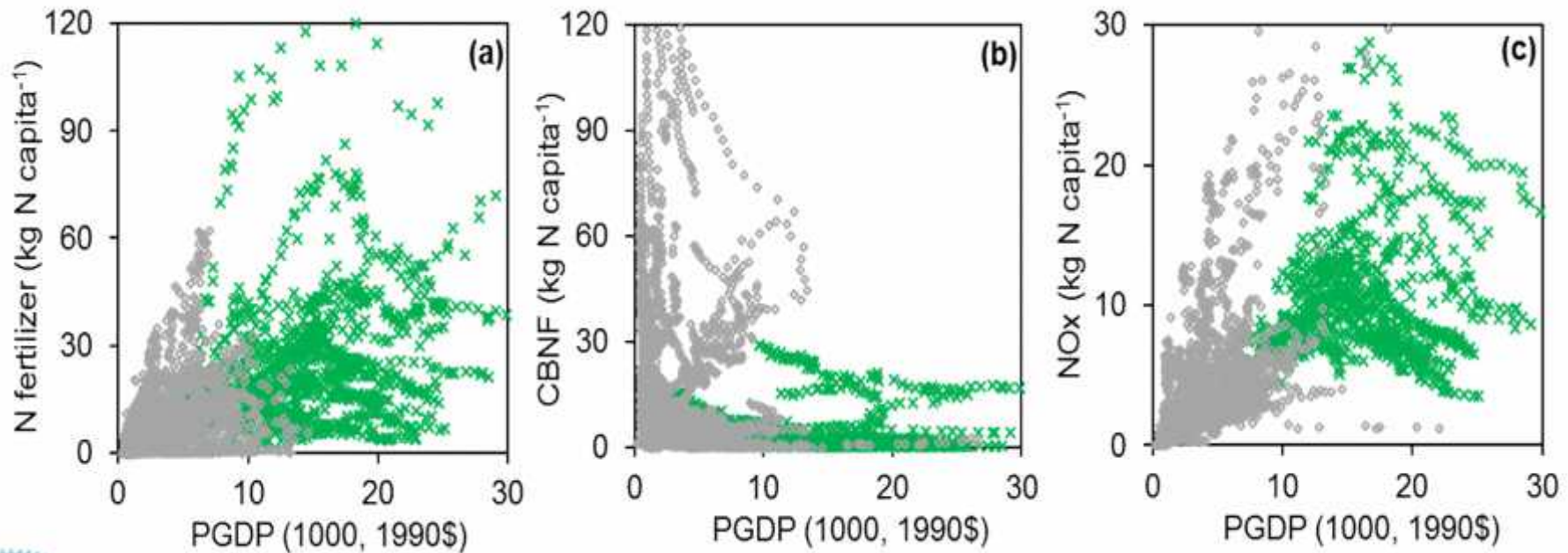
Data & Methods

- **Data (132 countries, 1961-2008):**
 - N inputs, NO_x , NH_3 , N_2O , CO_2 , and total GHG
 - PGDP (PPP), Energy consumption, Yield, cropland area, sown area...
- **Methods:**
 - Stepwise linear regression
 - Panel data model,
 - Integrated Biosphere Simulator (IBIS)

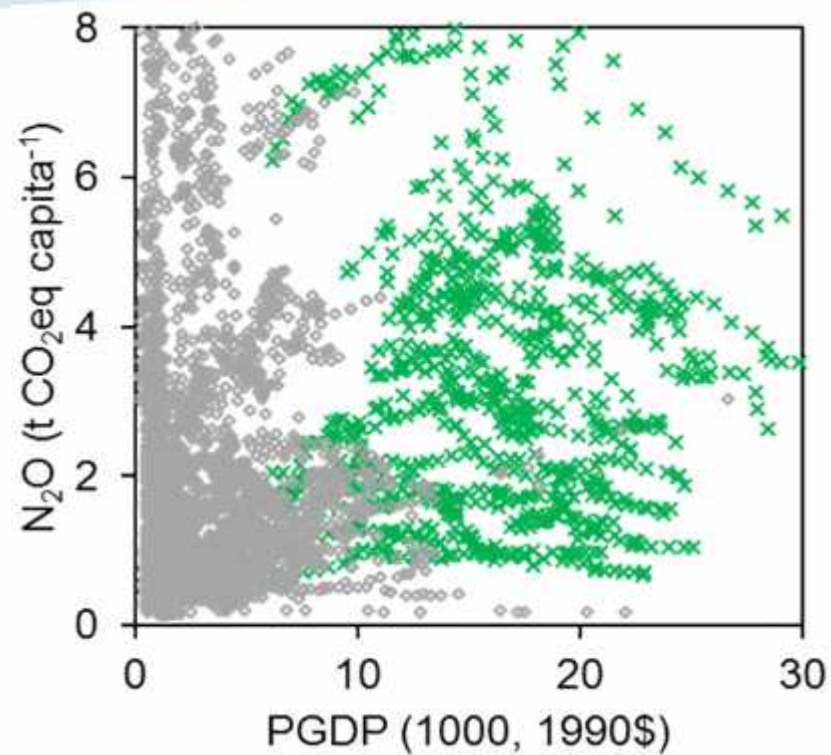
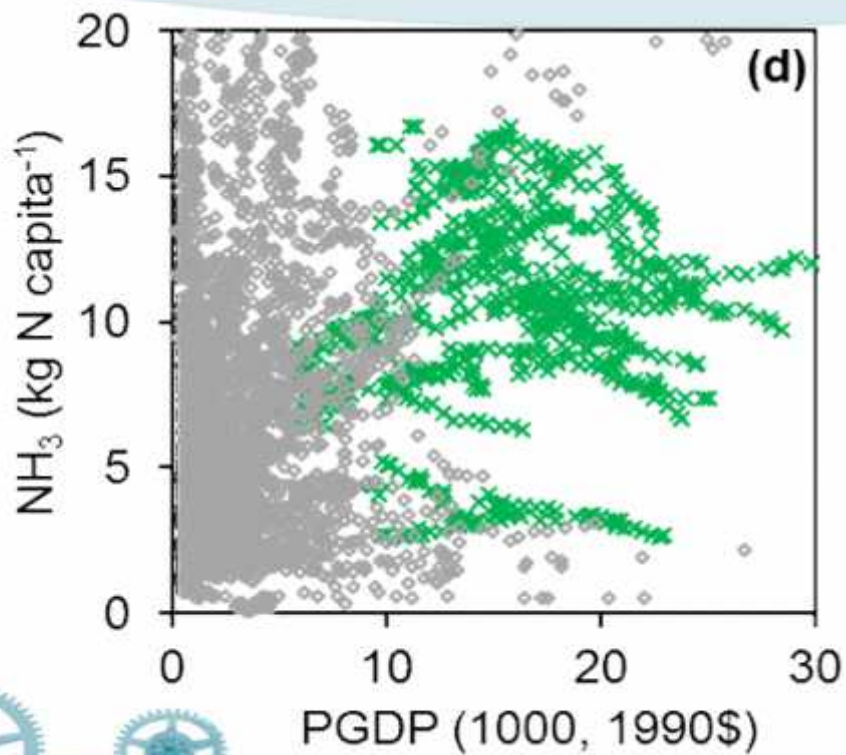
Panel model results

Variables	N Fertilizer	NO _x	CBNF	NH ₃	CO ₂	CO ₂ /(NO _x +NH ₃)
Per-capita GDP	0.630*** (0.185)	0.309*** (0.064)	-0.733*** (0.013)	0.043 (0.088)	0.571*** (0.084)	0.468*** (0.090)
Population	0.875*** (0.225)	0.126 (0.094)	-0.031*** (0.012)	-0.200 (0.115)	0.153 (0.147)	0.477*** (0.130)
Urbanization	-0.011 (0.009)	0.000 (0.004)	MC	0.011* (0.005)	-0.001 (0.005)	0.000 (0.005)
Group dummy	2.547** (0.864)	3.472*** (0.399)	NA	0.043 (0.064)	1.460*** (0.342)	NA
PGDP × dummy	-1.002*** (0.307)	-1.295*** (0.136)	NA	-0.358 (0.184)	-0.571*** (0.125)	NA
Intercept	-1.271*** (0.330)	0.291 (0.174)	3.222*** (0.030)	2.737*** (0.223)	0.394 (0.263)	3.395 (0.283)
N	5595	3842	4336	3347	3811	3347
R ² -within	0.223	0.550	0.457	0.264	0.540	0.280

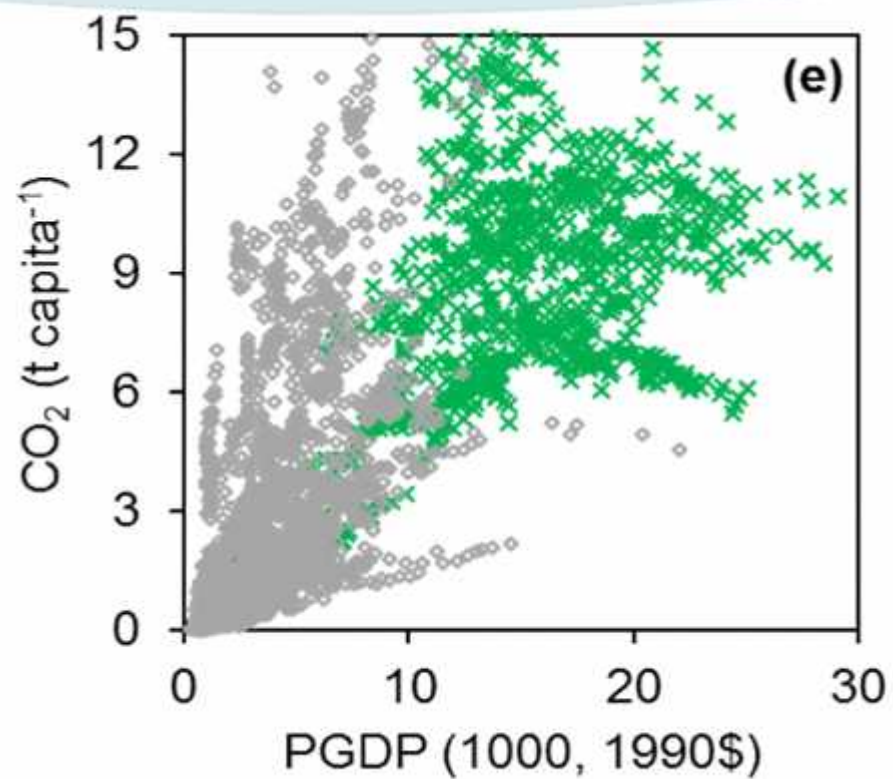
Turning points of N input



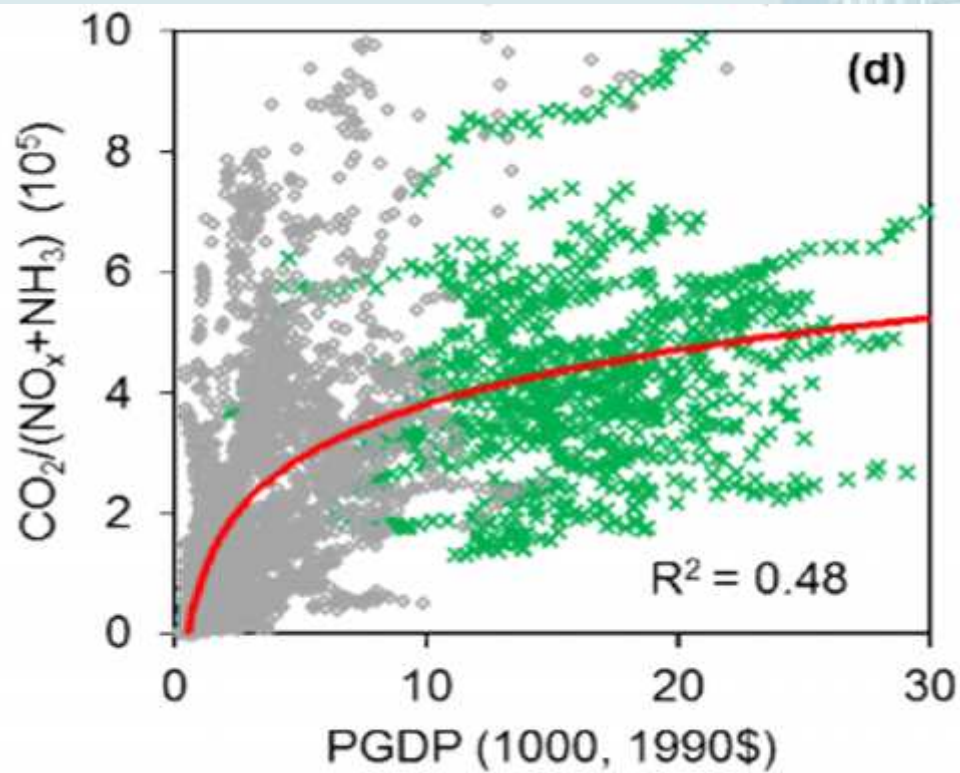
How about NH₃ and N₂O?



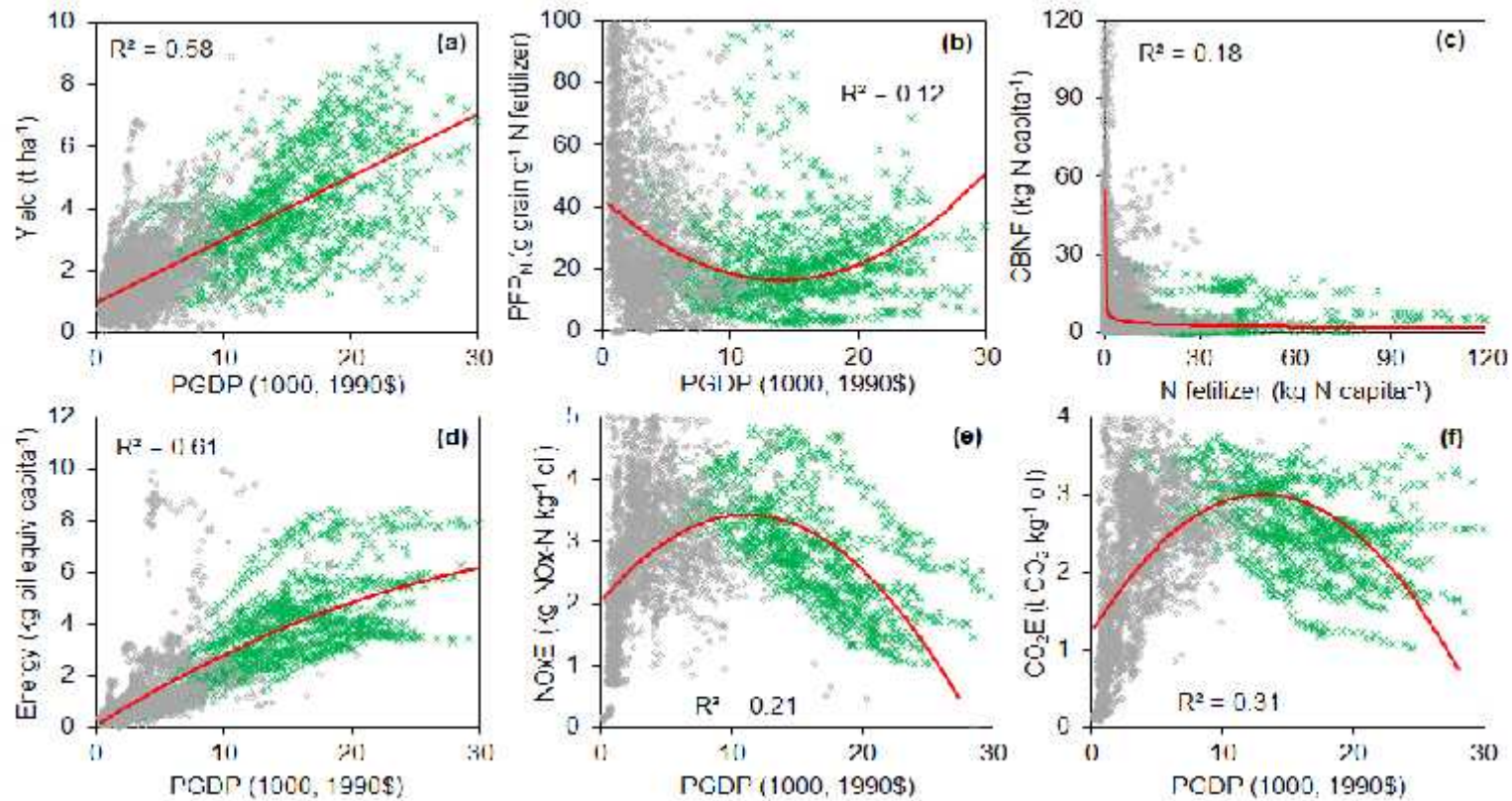
EKC of CO₂ emission



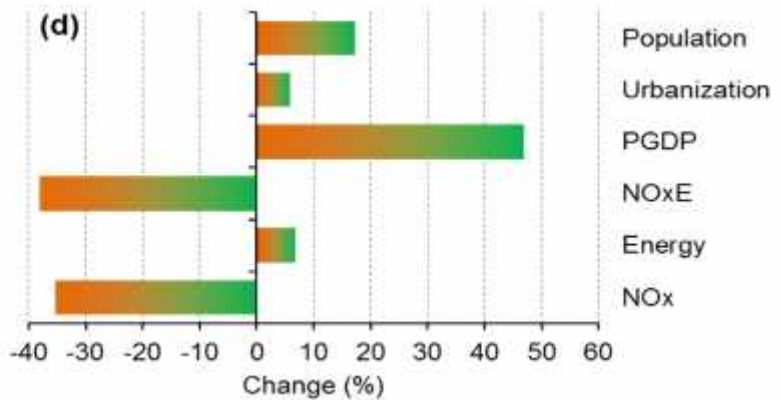
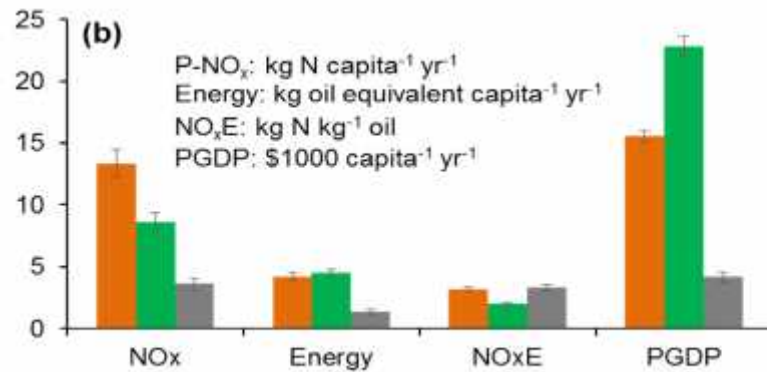
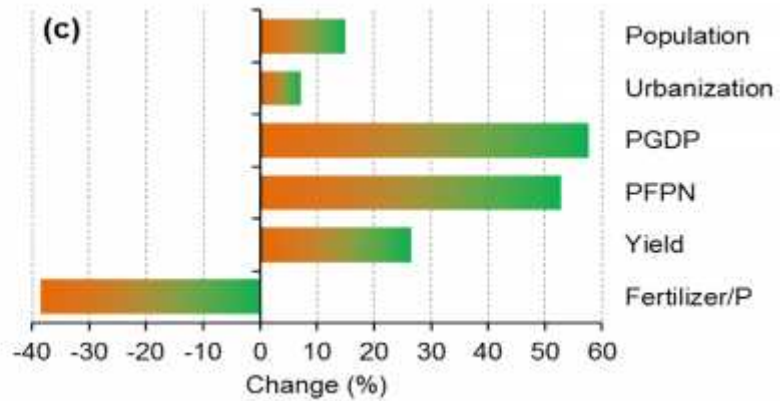
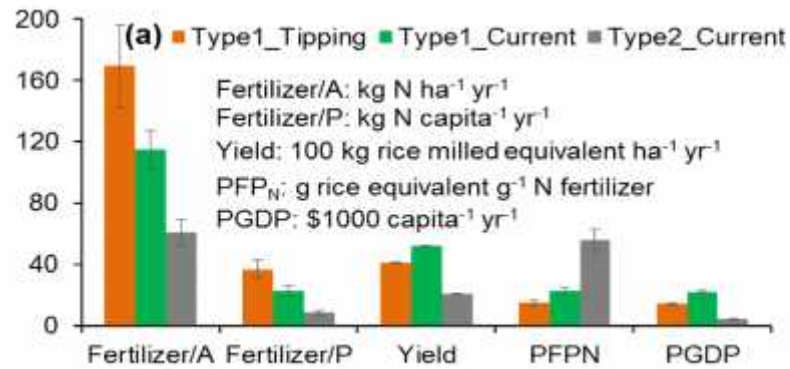
No turning points for C/N ratio



Explanations?

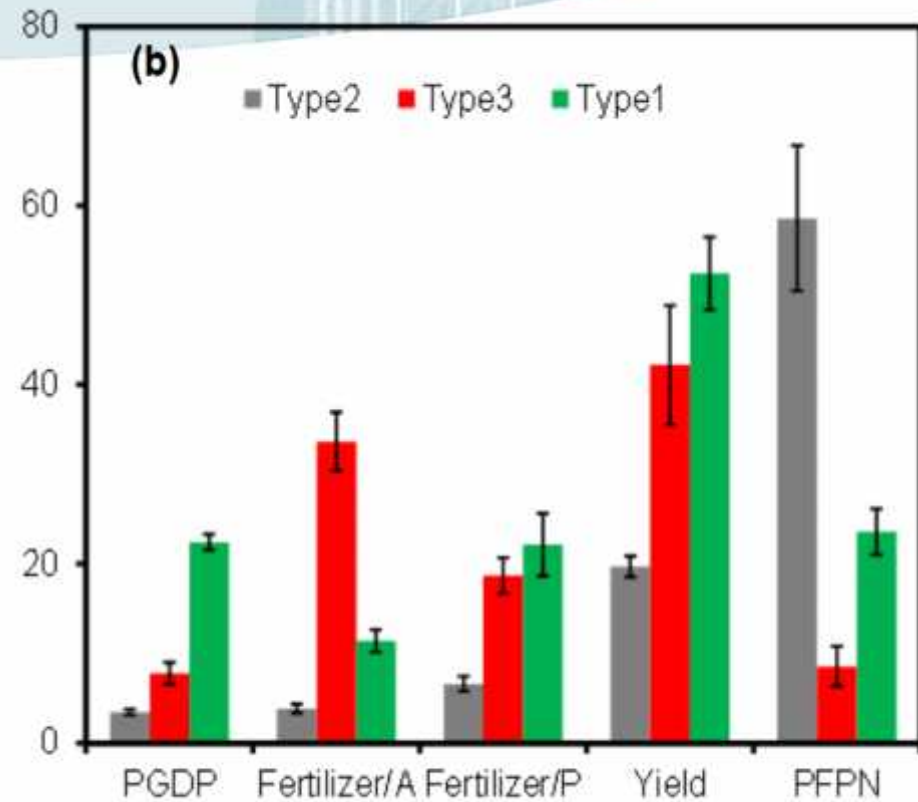
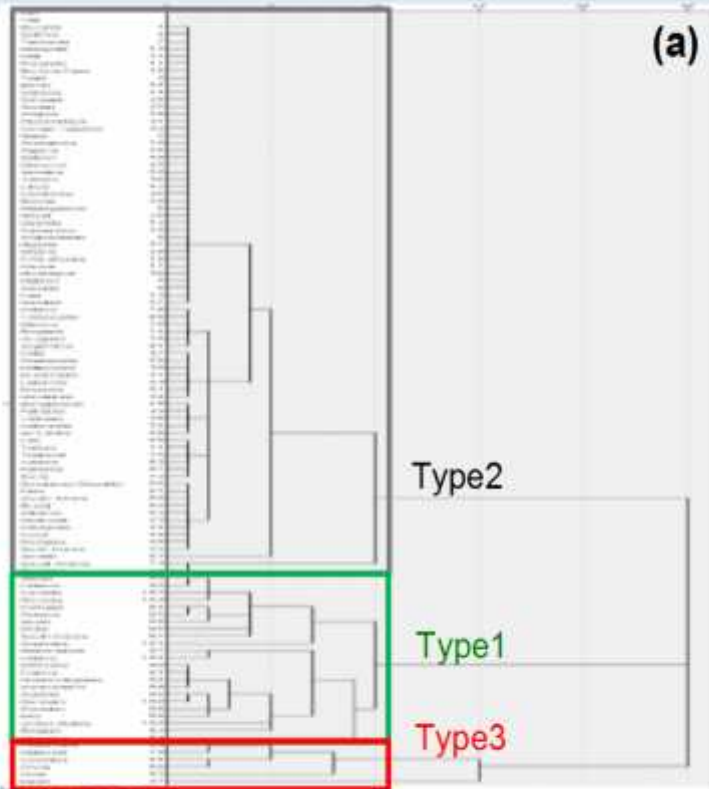


Reality...

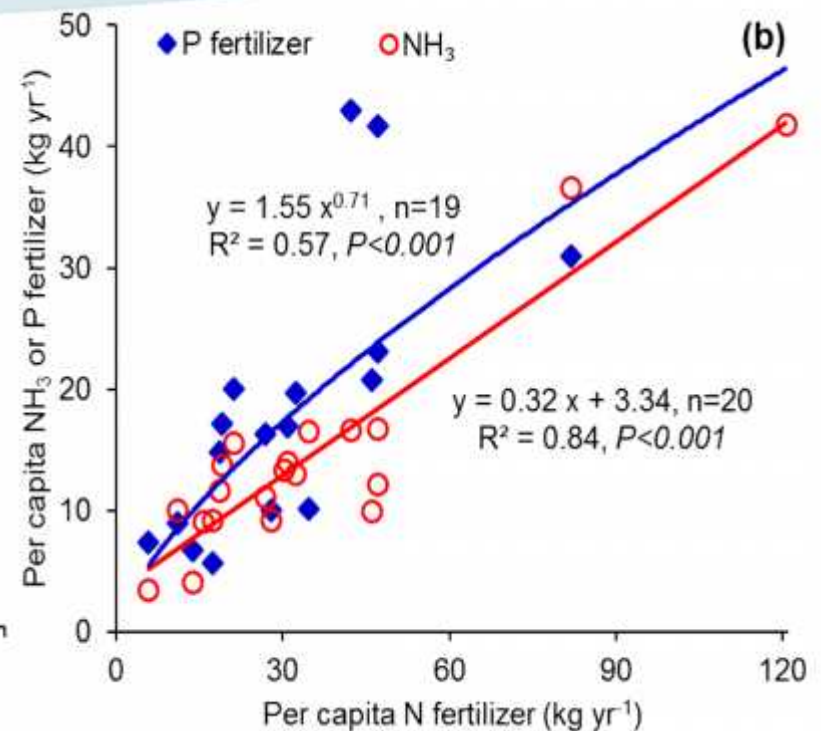
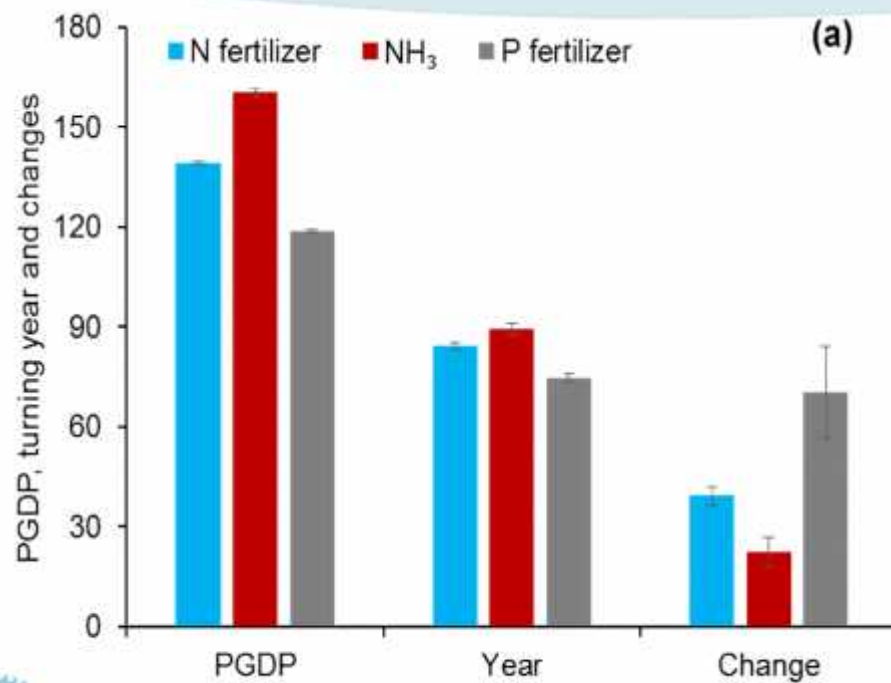


How about per area basis?

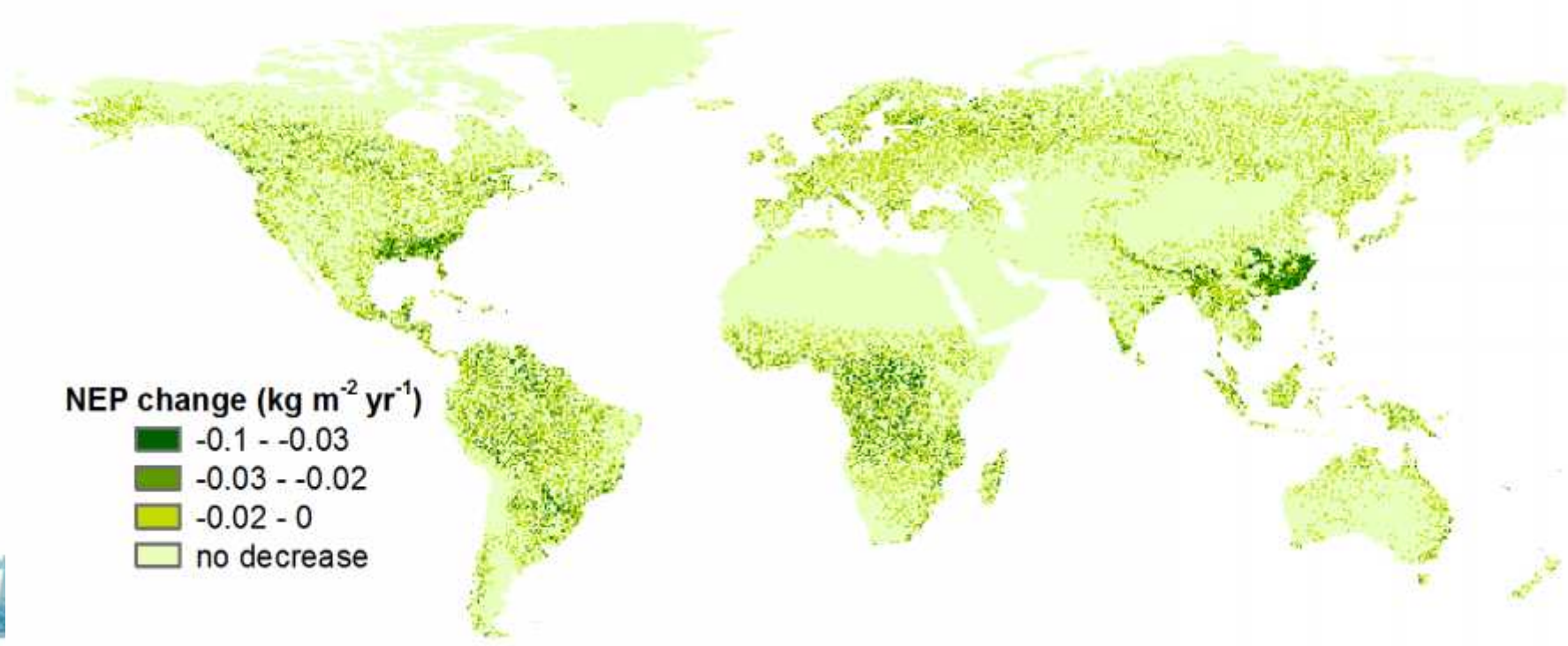
Cluster analysis based on PGDP, Fertilizer/A and Yield



Turning points of N, NH₃ and P



Carbon sink potential?



Q&A?

Thank you!

